# PATENT COOPERATION TREATY

Translation

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

# PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

| | |
|---|---|
| | Date of mailing *(day/month/year)* |
| Applicant's or agent's file reference<br>pf-3291 | FOR FURTHER ACTION<br>See paragraph 2 below |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| PCT/JP2004/007791 | 28.05.2004 | 29.05.2003 |

International Patent Classification (IPC) or both national classification and IPC

Applicant
NEC CORPORATION

1. This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☒ Box No. VIII — Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

| Name and mailing address of the ISA/JP | Authorized officer |
|---|---|
| Facsimile No. | Telephone No. |

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Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

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Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has:

   ☒ paid additional fees

   ☐ paid additional fees under protest

   ☐ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

Claims 1 to 23 have a common feature of relating to a multilayer wiring structure formed on an insulating film located on a substrate, but because this feature is well known from reference sources, this feature cannot be considered as a special technical feature.

Therefore, there is no special technical feature for linking the inventions of a group described by claims 1 to 23 so as to form a single general inventive concept. For this reason, the inventions of the groups described in claims 1 to 23 obviously do not satisfy the requirement of unity of inventions.

Furthermore, the number of groups of inventions so linked as to form a single general inventive concept that are described in the claims of the international patent application, that is, the number of inventions are examined below.

From the special features of the inventions described in independent claims, it can be inferred that four inventions divided into [1-18], [19, 20], [21, 23], [22] are described in the claims of the international patent application.

The invention of claims [1-18] is considered in greater detail below. Because the feature described in claim 1 is described in [JP 2000-183166 A, Full text (Nippon Electric Co., Ltd.)], it cannot serve as a special technical feature linking the inventions so as to form a single general inventive concept. Therefore, claims [1-18] apparently describe four inventions divided into [1, 2], [3-9, 13-15, 17, 18], [10-12], and [16].

Furthermore, the examination of the inventions described in claims [1, 2], [10-12], [16] demonstrates that those inventions are linked in terms of relating to an insulating barrier layer comprising silicon and an organic compound.

Furthermore, the examination of the inventions described in claims [1, 2], [21, 23], [22] demonstrates that those inventions are linked in terms of relating a wiring structure of multilayer wiring and a method for manufacture thereof.

Therefore, this examination finds that a total of three inventions of [1, 2, 10-12, 16, 21-23], [3-9, 13-15, 17, 18], [19, 20] are described in the claims of this international patent application.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

   ☒ all parts

   ☐ the parts relating to claims Nos. _____

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 5-20, 22, 23 | YES |
| | Claims | 1-4, 21 | NO |
| Inventive step (IS) | Claims | | YES |
| | Claims | 1-23 | NO |
| Industrial applicability (IA) | Claims | 1-23 | YES |
| | Claims | | NO |

2. Citations and explanations:

Document 1: JP 2000-183166 A ( NEC Corp. ), 30 June 2000, Full text, all drawings
Document 2: WO 2002/058134 A1 (STMICROELECTRONICS SA), 25 July 2002, Full text, all drawings
Document 3: WO 2001/054190 A1 (ADVANCED MICRO DEVICES), 26 July 2001, Full text, all drawings
Document 4: TADA M. et al. Barrier-metal-free (BMF), Cu dual-damascene interconnects with Cu-epi-contacts buried in anti-diffusive, low-k organic film, 2001 Symposium on VLSI Technology, 12 June 2001, pp. 13-14
Document 5: JP 2002-83870 A (Tokyo Electron, Ltd.), 22 March 2002, Full text, all drawings

Claims 1 to 3

The inventions of claims 1 to 3 do not appear to possess novelty or involve an inventive step based on document 1, document 2, and document 3.

Claim 4

The invention of claim 4 does not appear to possess novelty or involve an inventive step based on document 2. In the invention described in document 2, the films corresponding to the first insulating film and second insulating film of the invention of the present application are inorganic films. Therefore, the content of carbon in the insulating barrier film comprising an organic substance is apparently higher than that of the first and second insulating films.

Furthermore, the invention described in claim 4 does appear to involve an inventive step based on document 3. In the invention described in document 3, forming the film corresponding to the first insulating film from an inorganic film would be easy for a person skilled in the art.

Claims 5, 6, 17, 18

The inventions of claims 5 and 6 do not appear to involve an inventive step based on document 2 and document 3. Forming the film corresponding to the second insulating film in the invention described in document 2 and forming the film assumable as the first insulating film and second insulating film in the invention described in claim 3 as inorganic films could be easily conceived of by a person skilled in the art.

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Box No. VI Certain documents cited

1. Certain published documents (Rule 43*bis*.1 and 70.10)

| Application No. Patent No. | Publication date (day/month/year) | Filing date (day/month/year) | Priority date (valid claim) (day/month/year) |
|---|---|---|---|
| 2004-200203 A | 15.07.2004 | 16.12.2002 | |
| [EX] | | | |
| 2004-193326 A | 08.07.2004 | 11.12.2002 | |
| [EX] | | | |
| 2003-347403 A | 05.12.2003 | 30.05.2002 | |
| [EX] | | | |

2. Non-written disclosures (Rule 43*bis*.1 and 70.9)

| Kind of non-written disclosure | Date of non-written disclosure (day/month/year) | Date of written disclosure referring to non-written disclosure (day/month/year) |
|---|---|---|

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Mutual arrangement of "the third insulating film", "fourth insulating film", and "via interlayer insulating film" in claims 5 and 9 is not clear.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of V.2:

As for claims 17, 18, making the films corresponding to the first and second insulating films from the same material and specifically limiting this material to SiCN or the like could be easily conceived of by a person skilled in the art.

Claims 7, 8, 10, 11, 16

The inventions of claims 7, 8, 10, 11, 16 do not appear to involve an inventive step based on document 2 and document 3. Insulating films comprising Si-O bonds are well known as insulating films comprising an organic compound. Furthermore, the content of silicon atoms can be appropriately set by a person skilled in the art.

Claim 9

The invention of claim 9 does not appear to involve an inventive step based on document 2 and document 3. Making the films corresponding to the third insulating film and fourth insulating film from the same material in the inventions described in document 2 and document 3 could be easily conceived of by a person skilled in the art.

Claims 12-15

The invention described in document 12 does not appear to involve an inventive step based on document 2, document 3, and document 4. Document 4 discloses that divinylcyclohexane benzocyclobutene has a barrier property against the diffusion of Cu. Therefore, employing the technology described in document 4 as a barrier insulating film with the object of preventing the diffusion of copper in the inventions described in document 2 and document 3 could be easily conceived of by a person skilled in the art. Furthermore, with respect to the inventions described in claims 13-15, the material for an interlayer insulating film or an etching stopper film can be appropriately selected from well-known materials and limiting the range of materials as described in claims 3-15 could have easily been conceived of by a person skilled in the art.

Claims 19, 20

The inventions of claims 19 and 20 do not appear to involve an inventive step based on document 5. Using a porous interlayer insulating film with the object of reducing the dielectric constant of the interlayer insulating film in the invention described in document 5 could have easily been conceived of by a person skilled in the art.

Claim 21

The invention described in claim 21 does not appear to possess novelty or involve an inventive step based on document 2.

Claim 22

The invention described in claim 22 does not appear to involve an inventive step based on document 2. Forming a film corresponding to the second insulating film in the invention described in document 2 could be easily conceived of by a person skilled in the art.

Claim 23

The invention described in claim 23 does not appear to involve an inventive step based on document 2 and document 4. Using a plasma polymerization method disclosed in document 4 as a method for forming a barrier insulating film could be easily conceived of by a person skilled in the art.